

We claim:

1. A cubic liquid crystalline phase precursor comprising:

(A) an amphiphile capable of forming a cubic liquid crystalline phase,

(B) an optional solvent,

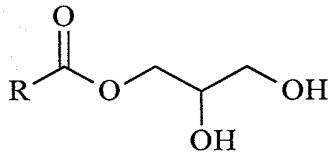
(C) an additive selected from the group consisting of an anchor, a tether, and combinations thereof, and

wherein (A), (B), and (C) are present in mass fractions relative to each other such that

$$1.0 = a + b + c$$

wherein a is the mass fraction of (A), b is the mass fraction of (B), and c is the mass fraction of (C), and wherein $1.0 > a > 0$, $1.0 > b > 0$, $1.0 > c > 0$; and with the proviso that a, b, and c do not fall within a cubic liquid crystalline phase region on a phase diagram representing phase behavior of (A), (B), and (C).

2. The precursor of claim 1, wherein (A) is a monoglyceride having the formula:



, wherein R is selected from the group consisting of monovalent hydrocarbon groups of 6 to 22 carbon atoms, and monoaliphatic halogenated hydrocarbon groups of 6 to 22 carbon atoms.

3. The precursor of claim 1, wherein (B) is a polar solvent selected from the group consisting of water, glycerol, glycols, formamides, ethylammonium nitrate, and combinations thereof.

4. The precursor of claim 1, wherein (C) is an anchor selected from the group consisting of positively charged surfactants and negatively charged surfactants.

5. The precursor of claim 4, wherein the anchor is a positively charged surfactant selected from the group consisting of quaternary surfactants, imidazoline based surfactants, substituted amino acids, and combinations thereof.

6. The precursor of claim 4, wherein the anchor is a negatively charged surfactant selected from the group consisting of alkyl carboxylates, modified carboxylates, isethionates, mono- and di-phosphate esters, alkyl sulphates, sulphonates, alkyl sulphonates, olefin sulphonates, alkyl benzene sulphonates, sulphosuccinates, and combinations thereof.

7. The precursor of claim 1, wherein (C) is a tether selected from the group consisting of derivatized polysaccharides, linear substituted polymers, star polymers, polypeptides, and polynucleotides, and combinations thereof.

8. The precursor of claim 7, wherein the tether is a derivatized polysaccharide selected from the group consisting of cellulose derivatives, chitin derivatives, starch derivatives, glycogen, glycoaminoglycans, glycoproteins, lignan based polymers, and combinations thereof.

9. The precursor of claim 7, wherein the tether is a linear substituted polymer selected from the group consisting of vinyl polymers, polyamines, polyamides, polyesters, polyphosphates, polysiloxanes, polycarbonates, polyethoxylates, and combinations thereof.

10. The precursor of claim 7, wherein the tether is a polypeptide selected from the group consisting of polylysine, lipoproteins, and combinations thereof.

11. The precursor of Claim 1 further comprising:

(D) an active ingredient.

12. The precursor of claim 11 wherein said precursor provides the topical delivery of a pharmaceutical, cosmetic active compound, and combinations thereof.

13. The precursor of claim 11 wherein said precursor provides nutrient delivery, encapsulation, stabilization, enzyme delivery, generate trans-membrane protein crystal structures, and combinations thereof

14. A bulk cubic liquid crystalline gel comprising:

(A) an amphiphile capable of forming a cubic liquid crystalline phase,

(B) a solvent,

(C) an additive selected from the group consisting of an anchor, a tether, and combinations thereof, and

wherein (A), (B), and (C) are present in mass fractions relative to each other such that

$$1.0 = a + b + c$$

wherein a is the mass fraction of (A), b is the mass fraction of (B), and c is the mass fraction of (C), and wherein $1.0 > a > 0$, $1.0 > b > 0$, $1.0 > c > 0$; and with the proviso that a, b, and c fall within a cubic liquid crystalline phase region on a phase diagram representing phase behavior of (A), (B), and (C).

15. The bulk cubic liquid crystalline gel of Claim 14 further comprising:

(D) an active ingredient.

16. A dispersion of cubic liquid crystalline gel particles comprising:

(A) an amphiphile capable of forming a cubic liquid crystalline phase,

(B) a solvent, and

(C) an additive selected from the group consisting of an anchor, a tether, and combinations thereof,

wherein (A), (B), and (C) are present in mass fractions relative to each other such

that

$$1.0 = a + b + c$$

wherein a is the mass fraction of (A), b is the mass fraction of (B), and c is the mass fraction of (C), and wherein $1.0 > a > 0$, $1.0 > b > 0$, $1.0 > c > 0$; and with the proviso that a, b, and c fall within a region representing cubic liquid crystalline phase in combination with at least one other phase on a phase diagram representing phase behavior of (A), (B), and (C), with the proviso that the dispersion has a form of functionalized cubic liquid crystalline gel particles dispersed in the other phase.

17. A method for preparing the cubic liquid crystalline phase precursor of Claim 1 comprising the steps of: combining (A) an amphiphile capable of forming a cubic liquid crystalline phase, (B) an optional solvent, (C) an additive selected from the group consisting of an anchor, a tether, and combinations thereof, and (D) an active ingredient, wherein (A), (B), and (C) are present in mass fractions relative to each other such that

$$1.0 = a + b + c$$

wherein a is the mass fraction of (A), b is the mass fraction of (B), and c is the mass fraction of (C), and wherein $1.0 > a \geq 0$, $1.0 > b \geq 0$, $1.0 > c \geq 0$; and with the proviso that a, b, and c do not fall within a cubic liquid crystalline phase region on a phase diagram representing phase behavior of (A), (B), and (C), and with the proviso that amounts of each ingredient in the composition are such that a cubic liquid crystalline phase forms upon occurrence of a stimulus.

18. The method of claim 17, wherein (A) is a liquid, and ingredients (A), (B), (C), and (D) are combined by mixing.

19. The method of claim 17, wherein (A) is a solid, and (A), (B), (C), and (D) are combined by a method selected from the group consisting of:

(a) heating (A) to a temperature greater than its melting point and then mixing (A) with ingredients (B), (C), and (D); and,

(b) fragmenting (A) into solid particles and thereafter combining (A) with (B),

(C), and (D).

20. The method of claim 17, wherein the stimulus is selected from the group consisting of:

- (a) addition of a specified material selected from the group consisting of additional amphiphile and solvent;
- (b) removal of a material selected from the group consisting of a portion of the amphiphile, and solvent;
- (c) a temperature change;
- (d) a pH change;
- (e) addition of a salt;
- (f) a pressure change; and,
- (g) combinations thereof.